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United States Department of Agriculture,

OFFICE OF EXPERIMENT STATIONS.

CIRCULAR NO. 25.

CANAIGRE.

Canaigre (*Rumex hymenosepalus*) is a plant bearing quite a resemblance to some of the more common docks, notably sour dock. The plant grows from 1 to 3 feet high from a cluster of tuberous roots somewhat resembling small sweet potatoes. The stem is rather simple, nearly smooth, and often red. The leaves vary from ovate to lanceolate, and are 2 to 8 inches long, tapering to a short petiole. The flower stalk is branched with compound erect branches; pedicels slender, about half the length of the fruit; fruiting valves membranous, ovate, one fourth to one half inch long, pinkish; seed one eighth to one fourth inch long. The roots are clustered in an upright position 3 to 12 inches below the surface of the ground. In number they vary from 2 to 15, are 2 to 4 inches long, and an inch or two in diameter, each weighing from 2 to 20 ounces when green. The plant seeds freely, but seems to propagate principally from the roots. When dug the roots may be kept for a year or more without depreciating in value in any way or impairing their germinating power.



TANNIN CONTENT.

The value of the plant consists in the amount of tannin contained in the tubers. Repeated analyses have shown that the tannin content varies from 17 to 38 per cent in the air-dried tubers, a quantity far in excess of that in any other of our tannin-producing plants.* The tannin, which is said to be rheo-tannic acid, seems to exist in solution in the cell sap of the tubers. The amount varies with the age and size of the root as well as the time of harvesting. The following table, compiled from various sources, shows the percentage of tannin contained in the roots grown at various places and dug at different times:

Tannin in canaigre.

| | Fresh material. | Air-dried material. | | Fresh material. | Air-dried material. |
|---|------------------|---------------------|--|------------------|---------------------|
| | <i>Per cent.</i> | <i>Per cent.</i> | | <i>Per cent.</i> | <i>Per cent.</i> |
| California, large roots | 9.6 | a 38.51 | Arizona, roots dug Nov. 16, 1892 | | 24.40 |
| California, small roots | | a 41.79 | Arizona, roots dug Jan. 17, 1893 | | 28.20 |
| California, not selected roots | | 34.20 | Arizona, young roots | 3.90 | 15.10 |
| California, roots dug after flowering | | 34.12 | Arizona, old roots | 10.00 | 32.00 |
| Arizona, roots from hard, sandy soil | | 22.50 | Arizona, leaves and stems | 0.80 | 3.90 |
| Arizona, roots from sandy loam | | 35.60 | U. S. Department of Agriculture, average | | 23.45 |
| Arizona, average 14 localities | | 30.52 | | | |
| Arizona, roots dug June 4, 1892 | | 16.70 | | | |

a Roots dried at 100° C.

WHERE GROWN.

Canaigre is found growing wild from central Indian Territory to southern Utah and south through Texas, New Mexico, Arizona, and southern California into Mexico. It has been successfully grown for several years in the botanic gardens at Berkeley, Cal. It was also grown in the grounds of the U. S. Department of Agriculture at Washington. Here the plants were not injured by the winter and made a good top growth, but either on account of the soil or the climate the root development was insignificant. Roots received from Arizona September, 1892, had made satisfactory growth at Philadelphia in April, 1893. At various places in New Mexico, Arizona, and elsewhere attempts have been made to grow canaigre under irrigation, with flattering success. There seems to be no information at hand as to the cultivation of canaigre in the Southern States, but doubtless the plant merits trial there, especially in the sandy soil of the Gulf States. Perhaps in sandy soil it may prove hardy as far north as Kansas and Colorado.

CULTURE.

A good sandy loam, with moderate cultivation, is necessary, but equally large crops have been produced on heavy soils where the roots are planted shallow and irrigated. The tubers are planted in rows

30 inches apart and 9 inches apart in the row, and require about 1 ton of roots per acre, from which it is estimated that the first season a yield of 10 tons of green roots may be obtained, and the second and succeeding seasons, 15 or even 20 tons.

In a wild state the plant makes its growth during the winter and early spring, and by June 1 has seeded and the tops are dead. The tubers lie dormant until after the winter rains, when the plants make their appearance once more. A short, quick season of growth seems to be necessary for this plant.

In Arizona the time for planting is between September and March. If planted late in the spring leaves will appear and die down at the usual time, and the root will lie dormant throughout the summer, beginning the formation of a new crop at the regular season, with no apparent advantage or disadvantage, as compared with roots planted just before the growing season.

The time of harvesting begins after the plant has made its full period of growth, and it has been found that the per cent of tannin increases as the tubers lie dormant in the ground, but the increase is very gradual after July.

The preparation of the land for planting and the cultivation of the crop are very similar to the methods used for Irish potatoes or other root crops. The cost of cultivating an acre in Arizona is estimated at \$16.50, which includes the irrigating and harvesting.

PREPARATION FOR MARKET.

As prepared for market the roots are sliced into pieces about one twentieth to one fourth of an inch thick and dried in the sun. When thus prepared they lose about two thirds their weight, and the dried product contains from 20 to 35 per cent tannin. Another method of preparation is by the making of an extract from the roots, which contains from 60 to 65 per cent tannin. This extract has been tested by Prof. Eitner, of the Vienna (Austria) Research Station for Leather Industry, and pronounced by him as especially adapted for tanning uppers, fine saddlery, and fancy leathers.

SUPPLY—VALUE.

The supply of wild canaigre is rapidly becoming exhausted. From January 1, 1891, to October 31, 1892, there were shipped to Europe, over the Southern Pacific Railway, 370 car loads of the sliced and dried roots, valued at \$40 to \$65 per ton. It is said that in New Mexico the green root is worth about \$5 per ton.

The information given in this circular is largely compiled from Arizona Station Bulletins Nos. 5 and 7; New Mexico Station Bulletins Nos. 8 and 11; California Station Bulletin No. 98 and Annual

Reports for 1884 and 1890; U. S. Department of Agriculture, Annual Reports for 1878 and 1879; Proceedings of National Museum, 1885; Revision of Rumex, by William Trelease, 1892; and American Journal of Pharmacy, 1889 and 1893.

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APPROVED:

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WASHINGTON, D. C., *May 15, 1894.*

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